



## Technical Memorandum

To: Jennifer Menges, Stantec From: Donald C. Anné, Senior Chemist

File: Marcus Hook Refinery Operations, a series of Evergreen Resources Group, LLC Date: April 6, 2017

**Reference: Data Usability Assessment – Eurofins Lancaster Laboratories Environmental Sample Data Group 1643102**

This memorandum presents the findings of analytical data validation and usability assessment of the data generated from the analysis of 17 soil samples, a field blank, and a trip blank. The samples were collected on March 22, 2016 by Stantec Consulting Services Inc. (Stantec) at the Marcus Hook Industrial Complex site. The data review was performed according to the quality assurance and quality control parameters set by the project laboratory and the following guidance documents.

- USEPA, 2017, National Functional Guidelines for Inorganic Superfund Data Review, EPA-540-R-2017-001, January 2017.
- USEPA, 2017, National Functional Guidelines for Organic Superfund Data Review, EPA-540-R-2017-002, January 2017.
- Stantec, 2016, Evergreen Data Usability – Data Updates, Standard Operating Procedures, May 20, 2016.

The samples were analyzed at Eurofins Lancaster Laboratories Environmental for volatile organic compounds (VOC), semi-volatile organic compounds (SVOC), and metals using the analytical methods listed below.

- VOCs by SW-846 Method 8260B
- SVOCs by SW-846 Method 8270C
- Metals by SW-846 Method 6010B

### 1. Validation Overview

The following table summarizes the laboratory and client sample identification numbers, sample collection dates, and analytical parameters subject to review.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters
1643102	8297808	3/22/2016	AOI5-BH-16-006(0-2')	VOCs, SVOCs, Metals
1643102	8297809	3/22/2016	AOI5-BH-16-006(3-4')	VOCs, SVOCs, Metals
1643102	8297810	3/22/2016	AOI5-BH-16-004(0-2')	VOCs, SVOCs, Metals
1643102	8297811	3/22/2016	AOI5-BH-16-004(5-6')	VOCs, SVOCs, Metals
1643102	8297812	3/22/2016	AOI5-BH-16-005(0-2')	VOCs, SVOCs, Metals
1643102	8297813	3/22/2016	AOI5-BH-16-005(3-4')	VOCs, SVOCs, Metals
1643102	8297814	3/22/2016	AOI5-BH-16-001(0-2')	VOCs, SVOCs, Metals
1643102	8297815	3/22/2016	AOI5-BH-16-002(0-2')	VOCs, SVOCs, Metals

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters
1643102	8297816	3/22/2016	AOI5-BH-16-002(3-4')	VOCs, SVOCs, Metals
1643102	8297817	3/22/2016	AOI5-BH-16-003(0-2')	VOCs, SVOCs, Metals
1643102	8297818	3/22/2016	AOI5-BH-16-003(3-4')	VOCs, SVOCs, Metals
1643102	8297819	3/22/2016	AOI5-BH-16-007(0-2')	VOCs, SVOCs, Metals
1643102	8297820	3/22/2016	AOI5-BH-16-007(3-4')	VOCs, SVOCs, Metals
1643102	8297821	3/22/2016	AOI5-BH-16-008(0-2')	VOCs, SVOCs, Metals
1643102	8297822	3/22/2016	AOI5-BH-16-008(3-4')	VOCs, SVOCs, Metals
1643102	8297823	3/22/2016	AOI5-BH-16-009(0-2')	VOCs, SVOCs, Metals
1643102	8297824	3/22/2016	AOI5-BH-16-009(3-4')	VOCs, SVOCs, Metals
1643102	8297825	3/22/2016	TB-20160322	VOCs
1643102	8297826	3/22/2016	FB-20160322	VOCs, SVOCs, Metals

The sample results were subject to a data review that includes, but is not limited to, an evaluation of the following parameters: laboratory raw data and finished data packages; chain-of-custody records; sample holding time, temperature, and sample preservation; blank data (trip, field, and method); calibration data; chromatograms; laboratory control sample/laboratory control sample duplicate recovery; matrix spike/matrix spike duplicate recovery; surrogate recovery; and overall data assessment.

The data qualifiers applied to the data are defined below.

- J The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
- J- The result is an estimated quantity, but the result may be biased low.
- UJ The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
- R The result is unusable. The sample result is rejected due to serious deficiencies in meeting QC criteria. The analyte may or may not be present in the sample.

## 2. Major Exceptions to Data Acceptance Criteria

Major exceptions include those that significantly impact data quality and require the rejection of results. Major exceptions were identified. The section below describes the major exceptions that were identified.

### a. VOCs by SW-846 Methods 8260B

#### i. Surrogate Recovery

One of four surrogate recoveries was below the control limit and below 10% for sample AOI5-BH-16-003(0-2'). Non-detect VOC results (Method 8260B) for the sample are rejected (R) and considered unusable. The compounds with positive concentrations are summarized in the following table.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters	Flags
1643102	8297817	3/22/2016	AOI5-BH-16-003(0-2')	Benzene, sec-butylbenzene, tert-butylbenzene, cyclohexane, 1,2-dichloroethane, 1,2-dibromoethane, n-hexane, isopropylbenzene, toluene, methyl tertiary butyl ether	R

### 3. Minor Exceptions to Data Acceptance Criteria

Minor exceptions effect data quality but do not result in unusable data. The section below describes the minor exceptions that were identified.

#### a. General Comment

Sample results reported below the laboratory reporting limit are flagged "J" to indicate that the results are estimated.

#### b. VOCs by SW-846 Methods 8260B

##### i. Surrogate Recovery

Four of four surrogate recoveries were below the control limits but not below 10% for sample AOI5-BH-16-009(3-4'). Positive VOC results (Method 8260B) for the sample are estimated, biased low (J-) and non-detect VOC results (Method 8260B) for the sample are estimated (UJ).

One of four surrogate recoveries were below the control limits and below 10% for sample AOI5-BH-16-003(0-2'). Positive VOC results (Method 8260B) for the sample are estimated, biased low (J-) and non-detect VOC results (Method 8260B) for the sample are rejected and are discussed in Section 2a.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters	Flag
1643102	8297824	3/22/2016	AOI5-BH-16-009(3-4')	Benzene, sec-butylbenzene, cyclohexane, isopropylbenzene, xylene	J-
1643102	8297824	3/22/2016	AOI5-BH-16-009(3-4')	Tert-butylbenzene, 1,2-dichloroethane, 1,2-dibromoethane, ethylbenzene, n-hexane, naphthalene, methyl tertiary butyl ether, toluene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene	UJ
1643102	8297817	3/22/2016	AOI5-BH-16-003(0-2')	Ethylbenzene, naphthalene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, xylene	J-

#### c. SVOCs by SW-846 Method 8270C

##### i. Continuing Calibration

AOI5-BH-16-002(3-4') and AOI5-BH-16-003(0-2'): The non-detect results for 2,4-dinitrophenol are qualified as estimated (UJ) in these associated samples because the %D was above the allowable maximum. There are no positive results for these compounds in the associated samples. The flagged results are summarized in the following table.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters	Flags
1643102	8297816	3/22/2016	AOI5-BH-16-002(3-4')	2,4-dinitrophenol	UJ
1643102	8297817	3/22/2016	AOI5-BH-16-003(0-2')	2,4-dinitrophenol	UJ

**ii. Matrix Spike/Matrix Spike Duplicate**

AOI5-BH-16-009(3-4'): The positive results for 14 compounds are qualified as estimated, biased low (J-), and the non-detect results for 12 compounds are qualified as estimated (UJ). One or two percent recoveries for the compounds were below QC limits, but not below 10%, in MS/MSD sample AOI5-BH-16-009(3-4'). Additionally, the relative percent differences for six compounds were above the allowable maximum; out of these six, only 2,4-dinitrophenol was not included in the above-mentioned 25 compounds. 2,4-Dinitrophenol was not detected in MS/MSD sample AOI5-BH-16-009(3-4'); this result is qualified as estimated (UJ). The flagged results are summarized in the following table.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters	Flags
1643102	8297824	3/22/2016	AOI5-BH-16-009(3-4')	Anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, 2-methylnaphthalene, phenanthrene, pyrene	J-
1643102	8297824	3/22/2016	AOI5-BH-16-009(3-4')	2,4-dinitrophenol, acenaphthene, 1,1'-biphenyl, di-n-butylphthalate, diethylphthalate, 2,4-dimethylphenol, bis(2-ethylhexyl)phthalate, 2-methylphenol, 4-methylphenol, phenol, pyridine, quinoline	UJ

**d. Metals by SW-846 Method 6010B**

**i. Matrix Spike/Matrix Spike Duplicate**

AOI5-BH-16-002(0-2') and AOI5-BH-16-002(3-4'): The positive results for chromium are qualified as estimated (J), and the non-detect results for selenium are qualified as estimated (UJ). One or two percent recoveries for the compounds were below QC limits, but not below 30%, in the associated MS/MSD sample. Additionally, the percent recoveries for chromium and selenium were within control limits in the associated post digestion spike sample. The flagged results are summarized in the following table.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters	Flags
1643102	8297815	3/22/2016	AOI5-BH-16-002(0-2')	chromium	J
1643102	8297816	3/22/2016	AOI5-BH-16-002(3-4')	chromium	J
1643102	8297815	3/22/2016	AOI5-BH-16-002(0-2')	selenium	UJ
1643102	8297816	3/22/2016	AOI5-BH-16-002(3-4')	selenium	UJ



#### **4. Comments**

All data that are not rejected (R) are considered usable with the specific qualifications noted above. Estimated (J, J-, and UJ) data is associated with a higher level of quantitative uncertainty.

Completeness of the data set is greater than 99% (defined as the percentage of analytical results that are considered to be valid).



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To: Jennifer Menges, Stantec From: Donald C. Anné, Senior Chemist  
File: Marcus Hook Refinery Operations, a series of Evergreen Resources Group, LLC Date: April 20, 2017

**Reference: Data Usability Assessment – Eurofins Lancaster Laboratories Environmental Sample Data Group 1644024**

This memorandum presents the findings of analytical data validation and usability assessment of the data generated from the analysis of 18 soil samples and one trip blank. The samples were collected on March 24, 2016 by Stantec Consulting Services Inc. (Stantec) at the Marcus Hook Industrial Complex site. The data review was performed according to the quality assurance and quality control parameters set by the project laboratory and the following guidance documents.

- USEPA, 2017, National Functional Guidelines for Inorganic Superfund Data Review, EPA-540-R-2017-001, January 2017.
- USEPA, 2017, National Functional Guidelines for Organic Superfund Data Review, EPA-540-R-2017-002, January 2017.
- Stantec, 2016, Evergreen Data Usability – Data Updates, Standard Operating Procedures, May 20, 2016.

The samples were analyzed at Eurofins Lancaster Laboratories Environmental for volatile organic compounds (VOC), semi-volatile organic compounds (SVOC), and metals using the analytical methods listed below.

- VOCs by SW-846 Method 8260B
- SVOCs by SW-846 Method 8270C
- Metals by SW-846 Method 6010B and SW-846 Method 7471A (Mercury)

### 1. Validation Overview

The following table summarizes the laboratory and client sample identification numbers, sample collection dates, and analytical parameters subject to review.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters
1644024	8302358	3/24/2016	AOI5-BH-16-036(0-2)	VOCs, SVOCs, Metals
1644024	8302359	3/24/2016	AOI5-BH-16-036(2-3)	VOCs, SVOCs, Metals
1644024	8302360	3/24/2016	AOI5-BH-16-037(0-2)	VOCs, SVOCs, Metals
1644024	8302361	3/24/2016	AOI5-BH-16-037(2-3)	VOCs, SVOCs, Metals
1644024	8302362	3/24/2016	AOI5-BH-16-038(0-2)	VOCs, SVOCs, Metals
1644024	8302363	3/24/2016	AOI5-BH-16-038(3-4)	VOCs, SVOCs, Metals
1644024	8302364	3/24/2016	AOI5-BH-16-035(0-2)	VOCs, SVOCs, Metals

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters
1644024	8302365	3/24/2016	AOI5-BH-16-035(3-4)	VOCs, SVOCs, Metals
1644024	8302366	3/24/2016	AOI5-BH-16-042(0-2)	VOCs, SVOCs, Metals
1644024	8302367	3/24/2016	AOI5-BH-16-042(5-6)	VOCs, SVOCs, Metals
1644024	8302368	3/24/2016	AOI5-BH-16-041(0-2)	VOCs, SVOCs, Metals
1644024	8302369	3/24/2016	AOI5-BH-16-041(6-7)	VOCs, SVOCs, Metals
1644024	8302370	3/24/2016	AOI5-BH-16-039(0-2)	VOCs, SVOCs, Metals
1644024	8302371	3/24/2016	AOI5-BH-16-039(2-3)	VOCs, SVOCs, Metals
1644024	8302372	3/24/2016	AOI5-BH-16-040(0-2)	VOCs, SVOCs, Metals
1644024	8302373	3/24/2016	AOI5-BH-16-040(2-3)	VOCs, SVOCs, Metals
1644024	8302374	3/24/2016	AOI5-BH-16-043(0-2)	VOCs, SVOCs, Metals
1644024	8302375	3/24/2016	AOI5-BH-16-043(3-4)	VOCs, SVOCs, Metals
1644024	8302376	3/24/2016	TB-20160324	VOCs

The sample results were subject to a data review that includes, but is not limited to, an evaluation of the following parameters: laboratory raw data and finished data packages; chain-of-custody records; sample holding time, temperature, and sample preservation; blank data (trip, field, and method); calibration data; chromatograms; laboratory control sample / laboratory control sample duplicate recovery; matrix spike / matrix spike duplicate recovery; surrogate recovery; and overall data assessment.

The data qualifiers applied to the data are defined below.

- J The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
- J+ The result is an estimated quantity, but the result may be biased high.
- J- The result is an estimated quantity, but the result may be biased low.
- UJ The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
- R The result is unusable. The sample result is rejected due to serious deficiencies in meeting QC criteria. The analyte may or may not be present in the sample.

## 2. Major Exceptions to Data Acceptance Criteria

Major exceptions include those that significantly impact data quality and require the rejection of results. Major exceptions were identified. The section below describes the major exceptions that were identified.

### a. SVOCs by SW-846 Method 8270C

#### i. Matrix Spike/Matrix Spike Duplicate

Two of two percent recoveries for pyridine, 2,4-dinitrophenol, 4-nitrophenol, bis(2-ethylhexyl)phthalate, diethylphthalate, di-n-butylphthalate, and quinoline were below the quality control limits and below 10% for MS/MSD sample AOI5-BH-16-039(0-2). Non-detect SVOC results (Method 8270C) for these seven



compounds for this sample are rejected (R) and considered unusable. The rejected results are summarized in the following table.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters	Flags
1644024	8302370	3/24/2016	AOI5-BH-16-039(0-2)	pyridine, 2,4-dinitrophenol, 4-nitrophenol, bis(2-ethylhexyl)phthalate, diethylphthalate, di-n-butylphthalate, and quinoline	R

### 3. Minor Exceptions to Data Acceptance Criteria

Minor exceptions effect data quality but do not result in unusable data. The section below describes the minor exceptions that were identified.

#### **a. General Comment**

Sample results reported below the laboratory reporting limit are flagged “J” to indicate that the results are estimated.

#### **b. VOCs by SW-846 Method 8260B**

##### **i. Surrogate Recovery**

One of four surrogate recoveries was below the control limits but not below 10% in sample AOI5-BH-16-042(5-6). Positive VOC results for the sample are estimated, biased low (J-) and non-detect VOC results for the sample are estimated (UJ). The flagged results are summarized in the table below.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameter	Flags
1644024	8302367	3/24/2016	AOI5-BH-16-042(5-6)	Sec-butylbenzene, isopropylbenzene, naphthalene, 1,2,4-trimethylbenzene, xylene	J-
1644024	8302367	3/24/2016	AOI5-BH-16-042(5-6)	Benzene, tert-butylbenzene, cyclohexane, 1,2-dibromoethane, 1,2-dichloroethane, ethylbenzene, n-hexane, methyl tertiary butyl ether, toluene, 1,3,5-trimethylbenzene	UJ

##### **ii. Internal Standard Area Summary**

Four of four internal standard areas for sample AOI5-BH-16-036(0-2) were below the control limits but not below 25%. Two of four internal standard areas for samples AOI5-BH-16-041(0-2), AOI5-BH-16-042(0-2), AOI5-BH-16-040(2-3), and AOI5-BH-16-043(0-2) were below control limits, but not below 25%. One of four internal standard areas for samples AOI5-BH-16-036(0-2) and AOI5-BH-16-040(0-2) were below control limits, but not below 25%. Positive VOC results for these samples that were quantitated using internal standard areas below control limits are estimated, biased high (J+), and non-detected VOC results for the samples should be considered estimated (UJ). The flagged results are summarized in the table below.



SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameter	Flags
1644024	8302358	3/24/2016	AOI5-BH-16-036(0-2)	Sec-butylbenzene, tert-butylbenzene, cyclohexane, naphthalene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene	J+
1644024	8302372	3/24/2016	AOI5-BH-16-040(0-2)	Sec-butylbenzene, tert-butylbenzene, naphthalene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene	J+/UJ
1644024	8302366 8302368 8302373 8302374	3/24/2016	AOI5-BH-16-042(0-2) AOI5-BH-16-041(0-2) AOI5-BH-16-040(2-3) AOI5-BH-16-043(0-2)	Sec-butylbenzene, tert-butylbenzene, ethylbenzene, isopropylbenzene, naphthalene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, xylene	J+/UJ

### ***iii. Continuing Calibration***

Samples AOI5-BH-16-038(3-4) and AOI5-BH-16-035(0-2): The percent difference for n-hexane was above the allowable maximum in the continuing calibration on 3/30/2016. Non-detect results for n-hexane should be considered estimated (UJ) in the associated samples. There are no positive results. The flagged results are summarized in the table below.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameter	Flags
1644024	8302363 8302364	3/24/2016	AOI5-BH-16-038(3-4) AOI5-BH-16-035(0-2)	n-hexane	UJ

### ***c. SVOCs by SW-846 Method 8270C***

#### ***i. Matrix Spike/Matrix Spike Duplicate***

AOI5-BH-16-039(0-2): One of two percent recoveries for each of 2-methylnaphthalene, benzo(a)pyrene, phenanthrene, and pyrene were above control limits. Positive results for these compounds should be considered estimated, biased high (J+). One of two percent recoveries for benzo(k)fluoranthene was below the quality control limit, but not below 10%. The positive result for benzo(k)fluoranthene should be considered estimated, biased low (J-). Two of two percent recoveries for seven compounds are below the quality control limits and below 10%. Results and the qualification for these seven compounds are addressed in section 2.a.i. The remaining results are summarized in the following table.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters	Flags
1644024	8302370	3/24/2016	AOI5-BH-16-039(0-2)	2-methylnaphthalene, benzo(a)pyrene, phenanthrene, and pyrene	J+
1644024	8302370	3/24/2016	AOI5-BH-16-039(0-2)	benzo(k)fluoranthene	J-



Reference: Data Usability Assessment, 1644024

**d. Metals by SW-846 Method 6010B**

**i. Matrix Spike/Matrix Spike Duplicate**

All soil samples except AOI5-BH-16-039(0-2): One of two percent recoveries for chromium was above control limits. Positive results for chromium in all soil samples, except the MS/MSD sample AOI5-BH-16-039(0-2), should be considered estimated, biased high (J+).

13 samples listed in table below: One of two percent recoveries for silver was above control limits. Positive results for silver in these 13 soil samples should be considered estimated, biased high (J+).

The qualifiers are summarized in the following table.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters	Flags
1644024	8302358	3/24/2016	AOI5-BH-16-036(0-2)	chromium	J+
	8302359		AOI5-BH-16-036(2-3)		
	8302360		AOI5-BH-16-037(0-2)		
	8302361		AOI5-BH-16-037(2-3)		
	8302362		AOI5-BH-16-038(0-2)		
	8302363		AOI5-BH-16-038(3-4)		
	8302364		AOI5-BH-16-035(0-2)		
	8302365		AOI5-BH-16-035(3-4)		
	8302366		AOI5-BH-16-042(0-2)		
	8302367		AOI5-BH-16-042(5-6)		
	8302368		AOI5-BH-16-041(0-2)		
	8302369		AOI5-BH-16-041(6-7)		
	8302371		AOI5-BH-16-039(2-3)		
	8302372		AOI5-BH-16-040(0-2)		
	8302373		AOI5-BH-16-040(2-3)		
	8302374		AOI5-BH-16-043(0-2)		
	8302375		AOI5-BH-16-043(3-4)		
1644024	8302358	3/24/2016	AOI5-BH-16-036(0-2)	silver	J+
	8302359		AOI5-BH-16-036(2-3)		
	8302360		AOI5-BH-16-037(0-2)		
	8302361		AOI5-BH-16-037(2-3)		
	8302362		AOI5-BH-16-038(0-2)		
	8302363		AOI5-BH-16-038(3-4)		
	8302364		AOI5-BH-16-035(0-2)		
	8302365		AOI5-BH-16-035(3-4)		
	8302366		AOI5-BH-16-042(0-2)		
	8302367		AOI5-BH-16-042(5-6)		
	8302368		AOI5-BH-16-041(0-2)		
	8302369		AOI5-BH-16-041(6-7)		
	8302374		AOI5-BH-16-043(0-2)		

**ii. Laboratory Duplicates**

AOI5-BH-16-039(2-3), AOI5-BH-16-040(0-2), AOI5-BH-16-040(2-3), AOI5-BH-16-043(3-4): The relative percent differences for silver were above the allowable maximum in associated batch duplicate and MS/MSD samples, so the non-detect results in these samples are considered estimated (UJ). AOI5-BH-16-039(0-2): The relative percent differences for zinc and lead were above the allowable maximum in the associated soil batch MS/MSD sample, so the positive results for zinc and lead are considered estimated (J).



SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters	Flags
1644024	8302371 8302372 8302373 8302375	3/24/2016	AOI5-BH-16-039(2-3) AOI5-BH-16-040(0-2) AOI5-BH-16-040(2-3) AOI5-BH-16-043(3-4)	silver	UJ
1644024	8302370	3/24/2016	AOI5-BH-16-039(0-2)	zinc, lead	J

**iii. ICP Serial Dilution**

AOI5-BH-16-039(0-2): The percent differences for cobalt and lead were above the allowable maximum for soil batch serial dilution sample P304851. The positive results for cobalt and lead are qualified as estimated (J) in the associated sample. There are no non-detect results in this sample for cobalt and lead. The flagged results are summarized in the following table.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters	Flags
1644024	8302370	3/24/2016	AOI5-BH-16-039(0-2)	cobalt, lead	J

**e. Mercury (Metals) by SW-846 Method 7471A**

**i. Matrix Spike/Matrix Spike Duplicate**

All soil samples except AOI5-BH-16-036(0-2): Two of two percent recoveries for mercury were below control limits and below 30% in the associated MS/MSD sample. Positive results for mercury in all soil samples, except AOI5-BH-16-036(0-2), should be considered estimated, biased low (J-). There are no non-detected results. The flagged results are summarized in the following table.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters	Flags
1644024	8302359 8302360 8302361 8302362 8302363 8302364 8302365 8302366 8302367 8302368 8302369 8302370 8302371 8302372 8302373 8302374 8302375	3/24/2016	AOI5-BH-16-036(2-3) AOI5-BH-16-037(0-2) AOI5-BH-16-037(2-3) AOI5-BH-16-038(0-2) AOI5-BH-16-038(3-4) AOI5-BH-16-035(0-2) AOI5-BH-16-035(3-4) AOI5-BH-16-042(0-2) AOI5-BH-16-042(5-6) AOI5-BH-16-041(0-2) AOI5-BH-16-041(6-7) AOI5-BH-16-039(0-2) AOI5-BH-16-039(2-3) AOI5-BH-16-040(0-2) AOI5-BH-16-040(2-3) AOI5-BH-16-043(0-2) AOI5-BH-16-043(3-4)	mercury	J-



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**Reference: Data Usability Assessment, 1644024**

#### **4. Comments**

All data that are not rejected (R) are considered usable with the specific qualifications noted above. Estimated (J, J+, J-, and UJ) data is associated with a higher level of quantitative uncertainty.

Completeness of the data set is greater than 99% (defined as the percentage of analytical results that are considered to be valid).



## Technical Memorandum

To: Jennifer Menges, Stantec

From: Donald C. Anné, Senior Chemist

File: Marcus Hook Refinery Operations, a series of Evergreen Resources Group, LLC

Date: April 21, 2017

**Reference: Data Usability Assessment – Eurofins Lancaster Laboratories Environmental Sample Data Group 1694281**

This memorandum presents the findings of analytical data validation and usability assessment of the data generated from the analysis of 11 ground water samples, one field duplicate, one field blank, and one trip blank. The samples were collected on August 11, 2016 by Stantec Consulting Services Inc. (Stantec) at the Marcus Hook Industrial Complex site. The data review was performed according to the quality assurance and quality control parameters set by the project laboratory and the following guidance documents.

- USEPA, 2017, National Functional Guidelines for Inorganic Superfund Data Review, EPA-540- R-2017-001, January 2017.
- USEPA, 2017, National Functional Guidelines for Organic Superfund Data Review, EPA-540-R- 2017-002, January 2017.
- Stantec, 2016, Evergreen Data Usability – Data Updates, Standard Operating Procedures, May 20, 2016.

The samples were analyzed at Eurofins Lancaster Laboratories Environmental for volatile organic compounds (VOC), semi-volatile organic compounds (SVOC), and metals using the analytical methods listed below.

- VOCs by SW-846 Methods 8260B and 8011 (EDB)
- SVOCs by SW-846 Method 8270C
- Metals by SW-846 Methods 6010B, 7470A (Hg), and 7196A (Cr<sup>+6</sup>)

### 1. Validation Overview

The following table summarizes the laboratory and client sample identification numbers, sample collection dates, and analytical parameters subject to review.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters
1694281	8523432	8/11/2016	MW-580_20160811	VOCs, SVOCs, Metals
1694281	8523433	8/11/2016	MW-578_20160811	VOCs, SVOCs, Metals
1694281	8523434	8/11/2016	MW-579_20160811	VOCs, SVOCs, Metals
1694281	8523435	8/11/2016	MW-128_20160811	VOCs, SVOCs, Metals
1694281	8523436	8/11/2016	MW-129_20160811	VOCs, SVOCs, Metals
1694281	8523437	8/11/2016	FB_20160811	VOCs, SVOCs, Metals
1694281	8523438	8/11/2016	MW-575_20160811	VOCs, SVOCs, Metals



SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters
1694281	8523439	8/9/2016	TB_20160811	VOCs
1694281	8523440	8/11/2016	MW-575_20160811DUP	VOCs, SVOCs, Metals
1694281	8523441	8/11/2016	MW-576_20160811	VOCs, SVOCs, Metals
1694281	8523442	8/11/2016	MW-573_20160811	VOCs, SVOCs, Metals
1694281	8523443	8/11/2016	MW-581_20160811	VOCs, SVOCs, Metals
1694281	8523444	8/11/2016	MW-582_20160811	VOCs, SVOCs, Metals
1694281	8523455	8/11/2016	MW-577_20160811	VOCs, SVOCs, Metals

The sample results were subject to a data review that includes, but is not limited to, an evaluation of the following parameters: laboratory raw data and finished data packages; chain-of-custody records; sample holding time, temperature, and sample preservation; blank data (trip, field, and method); calibration data; chromatograms; laboratory control sample / laboratory control sample duplicate recovery; matrix spike / matrix spike duplicate recovery; surrogate recovery; and overall data assessment.

The data qualifiers applied to the data are defined below.

- J The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
- J- The result is an estimated quantity, but the result may be biased low.
- UJ The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
- R The result is unusable. The sample result is rejected due to serious deficiencies in meeting QC criteria. The analyte may or may not be present in the sample.

## 2. Major Exceptions to Data Acceptance Criteria

Major exceptions include those that significantly impact data quality and require the rejection of results. Major exceptions were identified. The section below describes the major exceptions that were identified.

### a. SVOCs by SW-846 Method 8270C

#### i. *Surrogate Recovery*

FB\_20160811: Two of three acid extractable surrogate recoveries were below control limits, and one was below 10%. The non-detect results for 2,4-dimethylphenol, 2,4-dinitrophenol, 2-methylphenol, 4-methylphenol, 4-nitrophenol, and phenol for the field blank are rejected (R) and considered unusable. There were no positive results.



MW-582\_20160811: One of three acid extractable surrogate recoveries was below the control limit and was below 10% for this sample. The non-detect results for 2,4-dinitrophenol, 4-methylphenol, 4-nitrophenol, and phenol for are rejected (R) and considered unusable. Positive acid extractable compound results are addressed in section 3.d.i. The rejected results are summarized in the following table.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters	Flags
1694281	8523437	8/11/2016	FB_20160811	2,4-dimethylphenol, 2,4-dinitrophenol, 2-methylphenol, 4-methylphenol, 4-nitrophenol and phenol	R
1694281	8523444	8/11/2016	MW-582_20160811	2,4-dinitrophenol, 4-methylphenol, nitrophenol, and phenol	R

### 3. Minor Exceptions to Data Acceptance Criteria

Minor exceptions effect data quality but do not result in unusable data. The section below describes the minor exceptions that were identified.

#### a. General Comment

Sample results reported below the laboratory reporting limit are flagged "J" to indicate that the results are estimated.

#### b. VOCs by SW-846 Method 8260B

##### i. Field Duplicates

MW-575\_20160811 and MW-575\_20160811DUP: The relative percent differences (RPD) for cyclohexane and n-hexane were above the allowable maximum. The RPD for 1,2-dichloroethane could not be calculated due to a non-detect result. The difference in concentration between the two samples is significant. The positive results for cyclohexane and n-hexane are considered estimated (J) in the sample pair. There are no non-detect results for these analytes. The positive and non-detect results for 1,2-dichloroethane in the pair are considered estimated (J, UJ). The flagged results are summarized in the table below.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameter	Flags
1694281	8523438	8/11/2016	MW-575_20160811	Cyclohexane, n-hexane, and 1,2-dichloroethane	J J
1694281	8523440	8/11/2016	MW-575_20160811DUP	Cyclohexane and n-hexane 1,2-dichloroethane	J UJ





**c. VOCs by SW-846 Method 8011**

**i. Holding Times**

MW-582\_20160811 was analyzed beyond USEPA SW-846 holding times. The non-detect result for ethylene dibromide should be considered estimated (UJ).

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameter	Flag
1694281	8523444	8/11/2016	MW-582_20160811	ethylene dibromide	UJ

**ii. Continuing Calibration**

MW-575\_20160811DUP, MW-576\_20160811, MW-573\_20160811, MW-581\_20160811, and MW-577\_20160811: The percent difference for ethylene dibromide was above the allowable maximum in the continuing calibration 8/23/2016. The non-detect results for ethylene dibromide should be considered estimated (UJ) in the associated samples. There are no positive results for ethylene dibromide in the associated samples. The flagged results are summarized in the table below.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameter	Flag
1694281	8523440 8523441 8523442 8523443 8523455	8/11/2016	MW-575_20160811DUP, MW-576_20160811, MW-573_20160811, MW-581_20160811, and MW-577_20160811	ethylene dibromide	UJ

**d. SVOCs by SW-846 Method 8270C**

**i. Surrogate Recovery**

MW-582\_20160811: One of three acid extractable surrogate recoveries was below the control limit and was below 10% for this sample. The positive results for 2,4-dimethylphenol and 2-methylphenol are qualified as estimated, biased low (J-). Non-detect acid extractable compound results for these samples are addressed in section 2.a.i. The flagged positive results are summarized in the following table.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters	Flag
1694281	8523444	8/11/2016	MW-582_20160811	2,4-dimethylphenol and 2-methylphenol	J-

**ii. Field Duplicates**

MW-575\_20160811 and MW-575\_20160811DUP: The RPD for 2-methylnaphthalene, naphthalene, and phenol were above the allowable maximum in the field duplicate pair. The positive results for the three analytes are considered estimated (J) in the sample pair. There



are no non-detect results for these analytes. The flagged results are summarized in the table below.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameter	Flags
1694281	8523438 8523440	8/11/2016	MW-575_20160811 MW-75_20160811DUP	2-methylnaphthalene, naphthalene, and phenol	J

#### **4. Comments**

All data that are not rejected (R) are considered usable with the specific qualifications noted above. Estimated (J, J-, and UJ) data is associated with a higher level of quantitative uncertainty.

Completeness of the data set is greater than 99% (defined as the percentage of analytical results that are considered to be valid).



## Technical Memorandum

To: Jennifer Menges, Stantec From: Donald C. Anné, Senior Chemist

File: Marcus Hook Refinery Operations, a series of Evergreen Resources Group, LLC Date: April 4, 2017

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### Reference: Data Usability Assessment – Accutest Laboratories Sample Data Group JB39339

This memorandum presents the findings of analytical data validation and usability assessment of the data generated from the analysis of 7 soil samples collected on June 11, 2013 by Aquaterra Technologies, Inc. at the Marcus Hook Industrial Complex site. The data review was performed according to the quality assurance and quality control parameters set by the project laboratory and the following guidance documents.

- USEPA, 2017, National Functional Guidelines for Inorganic Superfund Data Review, EPA-540-R-2017-001, January 2017.
- USEPA, 2017, National Functional Guidelines for Organic Superfund Data Review, EPA-540-R-2017-002, January 2017.
- Stantec, 2016, Evergreen Data Usability – Data Updates, Standard Operating Procedures, May 20, 2016.

The samples were analyzed at the Accutest Laboratories facility in Dayton, NJ and Marlborough, MA for short list volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and metals using the analytical methods listed below.

- Volatiles by SW-846 Methods 8260B and 8011
- Semi-volatiles by SW846 Method 8270C
- Metals by SW-846 Method 6010C

### 1. Validation Overview

The following table summarizes the laboratory and client sample identification numbers, sample collection dates, and analytical parameters subject to review.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters
JB39339	JB39339-1	6/11/2013	AOI5_MW-465_1-2_061113	VOCs, SVOCs Metals
JB39339	JB39339-2	6/11/2013	AOI5_MW-465_3-4_061113	VOCs, SVOCs Metals
JB39339	JB39339-3	6/11/2013	AOI5_MW-462_1-2_061113	VOCs, SVOCs Metals
JB39339	JB39339-4	6/11/2013	AOI5_MW-462_7-8_061113	VOCs, SVOCs Metals
JB39339	JB39339-5	6/11/2013	AOI5_MW-468_8-10_061113	VOCs, SVOCs Metals
JB39339	JB39339-6	6/11/2013	AOI5_MW-461_0-2_061113	VOCs, SVOCs Metals
JB39339	JB39339-7	6/11/2013	AOI5_MW-461_2-4_061113	VOCs, SVOCs Metals



**Reference: Data Usability Assessment, JB39339**

The sample results were subject to a data review that includes, but is not limited to, an evaluation of the following parameters: laboratory raw data and finished data packages; chain-of-custody records; sample holding time, temperature, and sample preservation; blank data; calibration data; laboratory control sample/laboratory control sample duplicate recovery; matrix spike/matrix spike duplicate recovery; and overall data assessment.

The data qualifiers applied to the data are defined below.

UJ The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

## **2. Major Exceptions to Data Acceptance Criteria**

Major exceptions include those that significantly impact data quality and require the rejection of results. Major exceptions were not identified.

## **3. Minor Exceptions to Data Acceptance Criteria**

Minor exceptions effect data quality but do not result in unusable data. The section below describes the minor exceptions that were identified.

### **a. VOCs by Method SW-846 8260B**

#### ***i. Continuing Calibration***

The percent difference for 1,2-dichloroethane was above the allowable maximum (20%) on 6-13-2013 (3C99644.D). There are no associated positive sample results for 1,2-dichloroethane. The “non-detect” results for 1,2-dichloroethane in the associated samples were flagged “UJ.”

<b>SDG</b>	<b>Lab ID</b>	<b>Sample Date</b>	<b>Client Sample ID</b>	<b>Analytical Parameters</b>	<b>Flags</b>
JB39339	JB39339-3	6/11/2013	AOI5_MW-462_1-2_061113	1,2-dichloroethane	UJ
JB39339	JB39339-4	6/11/2013	AOI5_MW-462_7-8_061113	1,2-dichloroethane	UJ
JB39339	JB39339-5	6/11/2013	AOI5_MW-468_8-10_061113	1,2-dichloroethane	UJ
JB39339	JB39339-6	6/11/2013	AOI5_MW-461_0-2_061113	1,2-dichloroethane	UJ

## **4. Comments**

All data are considered usable with the specific exceptions and qualifications noted above.

Completeness of the data set is 100% (defined as the percentage of analytical results that are considered to be valid).



## Technical Memorandum

To: Jennifer Menges, Stantec From: Donald C. Anné, Senior Chemist  
File: Marcus Hook Refinery Operations, a series of Evergreen Resources Group, LLC Date: April 5, 2017

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**Reference: Data Usability Assessment – Accutest Laboratories Sample Data Group JB98590**

This memorandum presents the findings of analytical data validation and usability assessment of the data generated from the analysis of 20 ground water samples (10 unfiltered and filtered pairs), two field duplicates (one unfiltered and filtered pair), two field blanks (one unfiltered and filtered pair), and one trip blank (unfiltered only) - a subset of the samples that make up Sample Data Group JB98590. The samples were collected on July 6 and 7, 2015 by Stantec Consulting Services Inc. (Stantec) at the Marcus Hook Industrial Complex site. The data review was performed according to the quality assurance and quality control parameters set by the project laboratory and the following guidance documents.

- USEPA, 2017, National Functional Guidelines for Inorganic Superfund Data Review, EPA-540-R-2017-001, January 2017.
- USEPA, 2017, National Functional Guidelines for Organic Superfund Data Review, EPA-540-R-2017-002, January 2017.
- Stantec, 2016, Evergreen Data Usability – Data Updates, Standard Operating Procedures, May 20, 2016.

The samples were analyzed at the Accutest Laboratories facilities in Dayton, NJ for volatile organic compounds (VOC), semi-volatile organic compounds (SVOC), and metals using the analytical methods listed below.

- VOCs by SW-846 Methods 8260C and 8011
- SVOCs by SW-846 Methods 8270D and SIM 8270D
- Metals by SW-846 Method 6010C

### 1. Validation Overview

The following table summarizes the laboratory and client sample identification numbers, sample collection dates, and analytical parameters subject to review.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters
JB98590	JB98590-1	7/6/2015	MW-440-20150706	VOCs, SVOCs
JB98590	JB98590-1F	7/6/2015	MW-440-20150706	Metals
JB98590	JB98590-3	7/6/2015	MW-453-20150706	VOCs, SVOCs
JB98590	JB98590-3F	7/6/2015	MW-453-20150706	Metals
JB98590	JB98590-4	7/6/2015	FB-20150706	VOCs, SVOCs
JB98590	JB98590-4F	7/6/2015	FB-20150706	Metals
JB98590	JB98590-6	7/6/2015	MW-446-20150706	VOCs, SVOCs

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters
JB98590	JB98590-6F	7/6/2015	MW-446-20150706	Metals
JB98590	JB98590-8	7/6/2015	TB-20150706	VOCs
JB98590	JB98590-9	7/7/2015	MW-457-20150707	VOCs, SVOCs,
JB98590	JB98590-9F	7/7/2015	MW-457-20150707	Metals
JB98590	JB98590-11	7/7/2015	MW-479-20150707	VOCs, SVOCs
JB98590	JB98590-11F	7/7/2015	MW-479-20150707	Metals
JB98590	JB98590-12	7/7/2015	MW-478-20150707	VOCs, SVOCs
JB98590	JB98590-12F	7/7/2015	MW-478-20150707	Metals
JB98590	JB98590-13	7/7/2015	MW-468-20150707	VOCs, SVOCs
JB98590	JB98590-13F	7/7/2015	MW-468-20150707	Metals
JB98590	JB98590-14	7/7/2015	MW-469-20150707	VOCs, SVOCs
JB98590	JB98590-14F	7/7/2015	MW-469-20150707	Metals
JB98590	JB98590-16	7/7/2015	MW-461-20150707	VOCs, SVOCs
JB98590	JB98590-16F	7/7/2015	MW-461-20150707	Metals
JB98590	JB98590-17	7/7/2015	MW-448-20150707	VOCs, SVOCs
JB98590	JB98590-17F	7/7/2015	MW-448-20150707	Metals
JB98590	JB98590-18	7/7/2015	MW-468-DUP20150707	VOCs, SVOCs
JB98590	JB98590-18F	7/7/2015	MW-468-DUP20150707	Metals

The sample results were subject to a data review that includes, but is not limited to, an evaluation of the following parameters: laboratory raw data and finished data packages; chain-of-custody records; sample holding time, temperature, and sample preservation; blank data (trip, field, and method); calibration data; chromatograms; laboratory control sample/laboratory control sample duplicate recovery; matrix spike/matrix spike duplicate recovery; surrogate recovery; and overall data assessment.

The data qualifiers applied to the data are defined below.

- J The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
- UJ The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
- U The analyte was not detected above the reported sample quantitation limit.

## 2. Major Exceptions to Data Acceptance Criteria

Major exceptions include those that significantly impact data quality and require the rejection of results. Major exceptions were not identified.

## 3. Minor Exceptions to Data Acceptance Criteria

Minor exceptions effect data quality but do not result in unusable data. The section below describes the minor exceptions that were identified.



**a. VOCs by SW-846 Methods 8260C**

**i. Continuing Calibration**

Samples MW-448-20150707 and MW-468-DUP20150707: The percent difference on 07/17/2015 was above the allowable maximum. The non-detect result for hexane is qualified as estimated (UJ) for sample MW-448-20150707. The positive result for hexane is qualified as estimated (J) for sample MW-468-DUP20150707.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters	Flags
JB98590	JB98590-17	7/7/2015	MW-448-20150707	hexane	UJ
JB98590	JB98590-18	7/7/2015	MW-468-DUP20150707	hexane	J

**b. SVOCs by SW-846 Method 8270D**

**i. Field Duplicate**

Field duplicate pair MW-468-20150707/MW-468-DUP20150707: The relative percent differences were above the allowable maximum of 20% for 2,4-dimethylphenol, 2-methylphenol, 3&4-methylphenol, 1,1'-biphenyl, bis(2-ethylhexyl)phthalate, 2-methylnaphthalene, and naphthalene. The results for these compounds in the field duplicate pair are qualified as estimated (J). The flagged results are summarized in the following table.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters	Flags
JB98590	JB98590-13	7/7/2015	MW-468-20150707	2,4-dimethylphenol, 2-methylphenol, 3&4-methylphenol, 1,1'-biphenyl, bis(2-ethylhexyl)phthalate, 2-methylnaphthalene, and naphthalene	J
JB98590	JB98590-18	7/7/2015	MW-468-DUP20150707	2,4-dimethylphenol, 2-methylphenol, 3&4-methylphenol, 1,1'-biphenyl, bis(2-ethylhexyl)phthalate, 2-methylnaphthalene, and naphthalene	J

**c. SVOCs by SW-846 Method SIM 8270D**

**i. Continuing Calibration**

MW-457-20150707, MW-479-20150707, MW-478-20150707, MW-468-20150707, and MW-469-20150707: The non-detect results for benzo(a)anthracene and chrysene are qualified as estimated (UJ) in these associated samples because the percent differences were above the allowable maximum. There are no positive results for these compounds in the associated samples. The flagged results are summarized in the following table.



SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters	Flags
JB98590	JB98590-9	7/7/2015	MW-457-20150707	benzo(a)anthracene and chrysene	UJ
JB98590	JB98590-11	7/7/2015	MW-479-20150707	benzo(a)anthracene and chrysene	UJ
JB98590	JB98590-12	7/7/2015	MW-478-20150707	benzo(a)anthracene and chrysene	UJ
JB98590	JB98590-13	7/7/2015	MW-468-20150707	benzo(a)anthracene and chrysene	UJ
JB98590	JB98590-14	7/7/2015	MW-469-20150707	benzo(a)anthracene and chrysene	UJ

**ii. Field Duplicate**

Field duplicate pair MW-468-20150707/MW-468-DUP20150707: The relative percent differences were above the allowable maximum of 20% for naphthalene, fluorene, and phenanthrene. The results for these compounds in the field duplicate pair are qualified as estimated (J). The flagged results are summarized in the following table.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters	Flags
JB98590	JB98590-13	7/7/2015	MW-468-20150707	fluorene, naphthalene, and phenanthrene	J
JB98590	JB98590-18	7/7/2015	MW-468-DUP20150707	fluorene, naphthalene, and phenanthrene	J

**d. Metals by SW-846 Method 6010C**

**i. Blanks – Field Blank**

The field blank, FB-20150706, contains a trace of nickel. The nickel results that are less than 5 times the field blank level are considered non-detect (U). The flagged results are summarized in the following table.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameter	Flags
JB98590	JB98590-3	7/6/2015	MW-453-20150706	nickel	U
JB98590	JB98590-9	7/7/2015	MW-457-20150707	nickel	U
JB98590	JB98590-13	7/7/2015	MW-468-20150707	nickel	U
JB98590	JB98590-16	7/7/2015	MW-461-20150707	nickel	U
JB98590	JB98590-17	7/7/2015	MW-448-20150707	nickel	U
JB98590	JB98590-18	7/7/2015	MW-468-DUP20150707	nickel	U



#### **4. Comments**

All data are considered usable with the specific qualifications noted above. Estimated (J and UJ) data is associated with a higher level of quantitative uncertainty. Results flagged U are considered not detected concentrations.

Completeness of the validated data is 100% (defined as the percentage of analytical results that are considered to be valid).



## Technical Memorandum

To: Jennifer Menges, Stantec From: Donald C. Anné, Senior Chemist  
File: Marcus Hook Refinery Operations, a series of Evergreen Resources Group, LLC Date: April 4, 2017

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**Reference: Data Usability Assessment – Accutest Laboratories Sample Data Group JB99969**

This memorandum presents the findings of analytical data validation and usability assessment of the data generated from the analysis of 25 soil samples and a trip blank. The samples were collected on July 23, 2015 by Stantec Consulting Services Inc. (Stantec) at the Marcus Hook Industrial Complex site. The data review was performed according to the quality assurance and quality control parameters set by the project laboratory and the following guidance documents.

- USEPA, 2017, National Functional Guidelines for Inorganic Superfund Data Review, EPA-540-R-2017-001, January 2017.
- USEPA, 2017, National Functional Guidelines for Organic Superfund Data Review, EPA-540-R-2017-002, January 2017.
- Stantec, 2016, Evergreen Data Usability – Data Updates, Standard Operating Procedures, May 20, 2016.

The samples were analyzed at the Accutest Laboratories facilities in Dayton, NJ and Orlando, FL for volatile organic compounds (VOC), semi-volatile organic compounds (SVOC), and metals using the analytical methods listed below.

- VOCs by SW-846 Methods 8260C and 8011M
- SVOCs by SW-846 Method 8270D
- Metals by SW-846 Method 6010C (Lead)

### 1. Validation Overview

The following table summarizes the laboratory and client sample identification numbers, sample collection dates, and analytical parameters subject to review.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters
JB99969	JB99969-1	7/23/2015	MH-619-5-3	VOCs, SVOCs, Metals
JB99969	JB99969-2	7/23/2015	MH-619-4-3	VOCs, SVOCs, Metals
JB99969	JB99969-3	7/23/2015	MH-619-7-2	VOCs, SVOCs, Metals
JB99969	JB99969-4	7/23/2015	MH-619-3-3	VOCs, SVOCs, Metals
JB99969	JB99969-5	7/23/2015	MH-619-2-3	VOCs, SVOCs, Metals
JB99969	JB99969-6	7/23/2015	MH-619-1-3	VOCs, SVOCs, Metals
JB99969	JB99969-7	7/23/2015	MH-618-5-3	VOCs, SVOCs, Metals



SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters
JB99969	JB99969-8	7/23/2015	MH-618-4-3	VOCs, SVOCs, Metals
JB99969	JB99969-9	7/23/2015	MH-618-7-2	VOCs, SVOCs, Metals
JB99969	JB99969-10	7/23/2015	MH-618-2-3	VOCs, SVOCs, Metals
JB99969	JB99969-11	7/23/2015	MH-618-6-5	VOCs, SVOCs, Metals
JB99969	JB99969-12	7/23/2015	MH-618-3-3	VOCs, SVOCs, Metals
JB99969	JB99969-13	7/23/2015	MH-617-4-3	VOCs, SVOCs, Metals
JB99969	JB99969-14	7/23/2015	MH-617-5-3	VOCs, SVOCs, Metals
JB99969	JB99969-15	7/23/2015	MH-617-3-3	VOCs, SVOCs, Metals
JB99969	JB99969-16	7/23/2015	MH-617-2-3	VOCs, SVOCs, Metals
JB99969	JB99969-17	7/23/2015	MH-617-1-3	VOCs, SVOCs, Metals
JB99969	JB99969-18	7/23/2015	MH-617-7-2	VOCs, SVOCs, Metals
JB99969	JB99969-19	7/23/2015	MH-616-7-2	VOCs, SVOCs, Metals
JB99969	JB99969-20	7/23/2015	MH-616-1-3	VOCs, SVOCs, Metals
JB99969	JB99969-21	7/23/2015	MH-616-2-3	VOCs, SVOCs, Metals
JB99969	JB99969-22	7/23/2015	MH-616-3-3	VOCs, SVOCs, Metals
JB99969	JB99969-23	7/23/2015	MH-616-4-3	VOCs, SVOCs, Metals
JB99969	JB99969-24	7/23/2015	MH-616-6-5	VOCs, SVOCs, Metals
JB99969	JB99969-25	7/23/2015	MH-616-5-3	VOCs, SVOCs, Metals
JB99969	JB99969-26	7/23/2015	TB-20150723	VOCs

The sample results were subject to a data review that includes, but is not limited to, an evaluation of the following parameters: laboratory raw data and finished data packages; chain-of-custody records; sample holding time, temperature, and sample preservation; blank data (trip and method); calibration data; chromatograms; laboratory control sample/laboratory control sample duplicate recovery; matrix spike/matrix spike duplicate recovery; surrogate recovery; and overall data assessment.

The data qualifiers applied to the data are defined below.

- J The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
- J- The result is an estimated quantity, but the result may be biased low.
- UJ The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

## **2. Major Exceptions to Data Acceptance Criteria**

Major exceptions include those that significantly impact data quality and require the rejection of results. Major exceptions were not identified.



### 3. Minor Exceptions to Data Acceptance Criteria

Minor exceptions effect data quality but do not result in unusable data. The section below describes the minor exceptions that were identified.

#### a. VOCs by SW-846 Methods 8260C

##### i. *Surrogate Recovery*

Sample MH-617-5-3 (run#1): one of four surrogate recoveries was below the control limits but not below 10%. Positive results for isopropyl benzene, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene in sample MH-617-5-3 are qualified as estimated and biased low (J-). Non-detect results for methyl tert butyl ether, 1,2-dichloroethane, and naphthalene in sample MH-617-5-3 are qualified as estimated (UJ). The flagged results are summarized in the following table.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters	Flags
JB99969	JB99969-14	7/23/2015	MH-617-5-3	Isopropyl benzene	J-
JB99969	JB99969-14	7/23/2015	MH-617-5-3	1,2,4-trimethylbenzene	J-
JB99969	JB99969-14	7/23/2015	MH-617-5-3	1,3,5-trimethylbenzene	J-
JB99969	JB99969-14	7/23/2015	MH-617-5-3	methyl tert butyl ether	UJ
JB99969	JB99969-14	7/23/2015	MH-617-5-3	1,2-dichloroethane	UJ
JB99969	JB99969-14	7/23/2015	MH-617-5-3	naphthalene	UJ

##### ii. *Compound ID*

Positive results for benzene in samples MH-619-2-3, MH-618-4-3, and MH-617-4-3 were quantitated using data that was extrapolated beyond the highest calibration standard (flagged "E" by the laboratory). These results are qualified as estimated (J). The flagged results are summarized in the following table.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters	Flags
JB99969	JB99969-5	7/23/2015	MH-619-2-3	benzene	J
JB99969	JB99969-8	7/23/2015	MH-618-4-3	benzene	J
JB99969	JB99969-13	7/23/2015	MH-617-4-3	benzene	J



***b. SVOCs by SW-846 Method 8270D***

***i. Internal Standard Area Summary***

Samples MH-617-4-3 and MH-617-5-3, internal standard area IS5: The internal standard used to quantitate benzo(a)anthracene, chrysene, and pyrene in these two samples was below control limits but not below 20%. Non-detect results for these three compounds in these two samples are qualified as estimated (UJ). There are no positive results for these compounds in these samples. The flagged results are summarized in the following table.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters	Flags
JB99969	JB99969-13	7/23/2015	MH-617-4-3	benzo(a)anthracene, chrysene, pyrene	UJ
JB99969	JB99969-14	7/23/2015	MH-617-5-3	benzo(a)anthracene, chrysene, pyrene	UJ

**4. Comments**

All data are considered usable with the specific qualifications noted above. Estimated (J, J-, and UJ) data is associated with a higher level of quantitative uncertainty

Completeness of the data set is 100% (defined as the percentage of analytical results that are considered to be valid).



## Technical Memorandum

To: Jennifer Menges, Stantec

From: Donald C. Anné, Senior Chemist

File: Marcus Hook Refinery Operations, a series of Evergreen Resources Group, LLC

Date: April 4, 2017

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**Reference: Data Usability Assessment – Accutest Laboratories Sample Data Group JC4271**

This memorandum presents the findings of analytical data validation and usability assessment of the data generated from the analysis of 10 soil samples. The samples were collected on September 17, 2015 by Stantec Consulting Services Inc. (Stantec) at the Marcus Hook Industrial Complex site. The data review was performed according to the quality assurance and quality control parameters set by the project laboratory and the following guidance documents.

- USEPA, 2017, National Functional Guidelines for Inorganic Superfund Data Review, EPA-540-R-2017-001, January 2017.
- USEPA, 2017, National Functional Guidelines for Organic Superfund Data Review, EPA-540-R-2017-002, January 2017.
- Stantec, 2016, Evergreen Data Usability – Data Updates, Standard Operating Procedures, May 20, 2016.

The samples were analyzed at the Accutest Laboratories facilities in Dayton, NJ and Marlborough, MA for volatile organic compounds (VOC), semi-volatile organic compounds (SVOC), and metals using the analytical methods listed below.

- VOCs by SW-846 Methods 8260C and 8011
- SVOCs by SW-846 Method 8270D
- Metals by SW-846 Methods 6010C and 7471B

### 1. Validation Overview

The following table summarizes the laboratory and client sample identification numbers, sample collection dates, and analytical parameters subject to review.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters
JC4271	JC4271-1	9/17/2015	MHIC-388-4(0.0-2.0)	VOCs, SVOCs, Metals
JC4271	JC4271-2	9/17/2015	MHIC-388-2(0.0-2.0)	VOCs, SVOCs, Metals
JC4271	JC4271-3	9/17/2015	AOI5-BH-15-11(0.0-2.0)	VOCs, SVOCs, Metals
JC4271	JC4271-4	9/17/2015	AOI5-BH-15-11(11.0-11.5)	VOCs, SVOCs, Metals
JC4271	JC4271-5	9/17/2015	AOI5-BH-15-12(0.0-2.0)	VOCs, SVOCs, Metals
JC4271	JC4271-6	9/17/2015	AOI5-BH-15-12(11.0-11.5)	VOCs, SVOCs, Metals
JC4271	JC4271-7	9/17/2015	AOI5-BH-15-13(0.0-2.0)	VOCs, SVOCs, Metals





SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters
JC4271	JC4271-8	9/17/2015	AOI5-BH-15-13(8.0-10.0)	VOCs, SVOCs, Metals
JC4271	JC4271-9	9/17/2015	AOI5-BH-15-14(0.0-2.0)	VOCs, SVOCs, Metals
JC4271	JC4271-10	9/17/2015	AOI5-BH-15-14(11.0-11.5)	VOCs, SVOCs, Metals

The sample results were subject to a data review that includes, but is not limited to, an evaluation of the following parameters: laboratory raw data and finished data packages; chain-of-custody records; sample holding time, temperature, and sample preservation; blank data (method); calibration data; chromatograms; laboratory control sample/laboratory control sample duplicate recovery; matrix spike/matrix spike duplicate recovery; surrogate recovery; and overall data assessment.

The data qualifiers applied to the data are defined below.

- J The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
- UJ The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
- R The result is unusable. The sample result is rejected due to serious deficiencies in meeting QC criteria. The analyte may or may not be present in the sample.

## 2. Major Exceptions to Data Acceptance Criteria

Major exceptions include those that significantly impact data quality and require the rejection of results. Major exceptions were identified. The section below describes the major exceptions that were identified.

### a. SVOCs by SW-846 Method 8270D

#### i. Matrix Spike/Matrix Spike Duplicate

MS/MSD sample MHIC-388-4(0.0-2.0) – 2 of 2 percent recoveries for 2,4-dinitrophenol were below QC limits and below 10%. The “not detected” result for 2,4-dinitrophenol is flagged “R” and should be considered rejected, unusable in sample MHIC-388-4(0.0-2.0). The rejected result is presented in the following table.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameter	Flags
JC4271	JC4271-1	9/17/2015	MHIC-388-4(0.0-2.0)	2,4-dinitrophenol	R

## 3. Minor Exceptions to Data Acceptance Criteria

Minor exceptions effect data quality but do not result in unusable data. The section below describes the minor exceptions that were identified.

### a. General Comment

Sample results reported below the laboratory reporting limit are flagged “J” to indicate that the results are estimated.



***b. VOCs by SW-846 Methods 8260C***

***i. Continuing Calibration***

The percent differences for 1,2-dichloroethane and hexane were above the allowable maximum. Non-detect 1,2-dichloroethane results for the associated samples are estimated and flagged "UJ," and positive and non-detect hexane results for the associated samples are estimated and flagged "J" and "UJ," respectively.

There are no positive results for 1,2-dichloroethane in associated samples. The flagged results are summarized in the following table.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters	Flags
JC4271	JC4271-1	9/17/2015	MHIC-388-4(0.0-2.0)	1,2-dichloroethane	UJ
JC4271	JC4271-2	9/17/2015	MHIC-388-2(0.0-2.0)	1,2-dichloroethane	UJ
JC4271	JC4271-3	9/17/2015	AOI5-BH-15-11(0.0-2.0)	1,2-dichloroethane	UJ
JC4271	JC4271-4	9/17/2015	AOI5-BH-15-11(11.0-11.5)	1,2-dichloroethane	UJ
JC4271	JC4271-5	9/17/2015	AOI5-BH-15-12(0.0-2.0)	1,2-dichloroethane	UJ
JC4271	JC4271-7	9/17/2015	AOI5-BH-15-13(0.0-2.0)	hexane	J
JC4271	JC4271-9	9/17/2015	AOI5-BH-15-14(0.0-2.0)	hexane	UJ

***c. SVOCs by SW-846 Method 8270D***

***i. Continuing Calibration***

The percent difference for 4-nitrophenol was above the allowable maximum on the calibration date, 9/22/2015. Non-detect 4-nitrophenol results for the associated samples are estimated and flagged "UJ." There are no positive results for 4-nitrophenol in associated samples.

SDG	Lab ID	Sample Date	Client Sample ID	Analytical Parameters	Flags
JC4271	JC4271-1	9/17/2015	MHIC-388-4(0.0-2.0)	4-nitrophenol	UJ
JC4271	JC4271-2	9/17/2015	MHIC-388-2(0.0-2.0)	4-nitrophenol	UJ
JC4271	JC4271-3	9/17/2015	AOI5-BH-15-11(0.0-2.0)	4-nitrophenol	UJ
JC4271	JC4271-4	9/17/2015	AOI5-BH-15-11(11.0-11.5)	4-nitrophenol	UJ
JC4271	JC4271-5	9/17/2015	AOI5-BH-15-12(0.0-2.0)	4-nitrophenol	UJ
JC4271	JC4271-6	9/17/2015	AOI5-BH-15-12(11.0-11.5)	4-nitrophenol	UJ
JC4271	JC4271-7	9/17/2015	AOI5-BH-15-13(0.0-2.0)	4-nitrophenol	UJ
JC4271	JC4271-8	9/17/2015	AOI5-BH-15-13(8.0-10.0)	4-nitrophenol	UJ
JC4271	JC4271-9	9/17/2015	AOI5-BH-15-14(0.0-2.0)	4-nitrophenol	UJ
JC4271	JC4271-10	9/17/2015	AOI5-BH-15-14(11.0-11.5)	4-nitrophenol	UJ



#### **4. Comments**

All data that are not qualified rejected (R) are considered usable with the specific exceptions and qualifications noted above. Estimated (J and UJ) data is associated with a higher level of quantitative uncertainty

Completeness of the data set is greater than 99% (defined as the percentage of analytical results that are considered to be valid).